## **GENERAL INSTRUCTIONS**

- All question are compulsory.
- Section A: Q no. 1 to 20 are very short answer questions (objective type) and carry 1 mark each.
- Section B: Q no. 21 to 27 are short answer questions and carry 2 marks each.
- Section C: Q no. 28 to 34 are long answer questions and carry 3 mark each.
- Section D: Q no. 35 to 37 are also long answer question and carry 5 marks each.
- There is no overall choice. However, an internal choice has been provided in two questions of two marks, two questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.
- Use log tables if necessary, use of calculators is not allowed.

# **SECTION - A**

## **Passage Based Questions**

Read the given passage and answer the following questions.

Molar conductivity of a solution is the conductance of solution containing one mole of electrolyte, kept between two electrodes having unit length between them and large cross-sectional area, so as the contain the electrolyte. In other words, molar conductivity is the conductance of the electrolytic solution kept between the electrodes of a conductivity cell at unit distance but having area of cross-section large enough to accommodate sufficient volume of solution that contains one mole of the electrolyte. It is denoted by  $\Lambda_m$ .

- 1. Write the mathematics expression for molar conductivity.
- 2. What are the units of molar conductivity  $\Lambda_m$ ?
- 3. Conductivity of 0.00241 M acetic acid is  $7.896 \times 10^{-5}$  Scm<sup>-1</sup>. Calculate its molar conductivity in this solution.
- **4.** How does molar conductivity varies with concentration for strong as well as weak electrolytes?
- **5.** Give the graphical representation of variation of conductivity with concentration for weak electrolytes?

## **One Word Answer Type Questions**

Here, we have given some questions that relates to a particular term or substance. You are required to a particular term or substance. You are required to give the one word answer for all.

- **6.** Name the element which is uses as a reducing agent in thermite welding.
- 7. Name the carbohydrate formed through the glycoside linkage between C-1 of  $\beta$  D-galactose and C-4 of  $\beta$  D-glucose.
- **8.** Name the species formed when secondary amines react with nitrous acid to form a yellow green oily layer.
- **9.** Name an artificial sweetener whose use is limited to cold foods and drinks.
- **10.** Which of the following isomers is most volatile in nature?

o-nitrophenol, p-nitrophenol, m-nitrophenol

## **Multiple Choice Questions**

There are four options for each questions, out of these only one is correct. You have to identify the correct option.

- 11. According to postulates of Werner's theory for coordination compounds, which of the following is true?
  - (a) Primary valencies are ionisable.
  - (b) Secondary valencies are isonisable.
  - (c) Only primary valencies are non-ionisable
  - (d) Both primary and secondary valencies are non-ionisable.
- 12. The IUPAC name of the compound,

CLASS: 12th

- (a) 2-chloro-5-hydroxyhexane
- (b) 2-hydroxy-5-chlorohexane
- (c) 5-chlorohexan -2-ol
- (d) 2-chlorohexan -5-ol
- 13. CH<sub>3</sub>CH<sub>2</sub>OH can be converted into CH<sub>3</sub>CHO by
  - (a) catalytic hydrogenation
  - (b) treatment with LiAlH<sub>4</sub>
  - (c) treatment with pyridinium chlorochromate
  - (d) treatment with KMnO<sub>4</sub>
- **14.** The hybridisation of various xenon complexes are as follow:

S. No.	Complex	Hybridisation
1	XeF <sub>2</sub>	sp <sup>3</sup> d
2	XeO <sub>3</sub>	sp <sup>3</sup>
3	XeF <sub>4</sub>	sp <sup>3</sup> d <sup>2</sup>

The complex which contains maximum number of lone pairs is

- (a) XeO<sub>3</sub>
- (b) XeF<sub>2</sub>
- (c) XeF<sub>4</sub>
- (d) Both XeF<sub>2</sub> and XeO<sub>3</sub>
- **15.** Which of the following was first used for curing syphilis?
  - (a) Penicilin
- (b) Equanil
- (c) Salvarsan
- (d) Chlorampheniol

## **Assertion-Reason**

In the following questions, a statement of Assertion is followed by a corresponding statement of Reason. Of the following statements, choose the correct one.

- (a) Both Assertion and Reason are correct statements and Reason is the correct explanation of the Assertion.
- (b) Both Assertion and Reason are correct statements, but Reason is not the correct explanation of the Assertion.
- (c) Assertion is correct, but Reason is incorrect statement.
- (d) Assertion is incorrect but reason is correct statement.
- **16. Assertion** It is difficult to replace chlorine by OH in Chlorobenzene in comparison to that in chloroethane. **Reason** Chlorine carbon (C Cl) bond in Chlorobenzene has partial double bond character due to resonance.
- 17. Assertion Phenols give o-and p-nitrophenol on nitration with conc. HNO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub> mixture.

**Reason** OH group is phenol is o-, p- directing.

**18.** Assertion All naturally occurring  $\propto$  - aminoacids except glycine are optically active.

**Reason** Most naturally occurring amino acids have L-configuration.

19. Assertion Chromium is a typical hard metal, while mercury is a liquid.

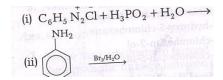
**Reason** In Cr, there are six unpaired electrons, whereas in Hg, there is no unpaired electron.

**20. Assertion** Chelating ligands form more stable complexes than the unidentate analongs.

**Reason** When chelation occurs in the complexes, entropy decreases.

## **SECTION: B**

**21.** Complete the following reactions:



- 22. Write one similarity and one difference between the chemistry of lanthanoids and that of actinoids.
- **23.** The standard oxidation potential of Ni/Ni<sup>2+</sup> electrode is 0.236 V. if this is combined with at what pH of the solution will measured emf be zero at 25°C?

CLASS: 12th

- **24.** Answer the following
  - (i) What is the role of following complex in analytical chemistry?
    - (a) EDTA

- (b) DMG
- (ii) Arrange the following complex ions in increasing order of crystal field splitting energy  $(\Delta_0)$ .

$$[CrCl_6]^{3-}$$
,  $[Cr(CN)_6]^{3-}$ ,  $[Cr(NH_3)_6]^{3+}$ 

OR

Write the IUPAC nomenclature and also draw structural isomers of  $[Cr(NH_3)_4 \ Cl_2]^+$  and  $[Co(en)_3]^{3+}$  complex.

- **25.** Answer the following:
  - (i) Why, coagulation takes place when NaCl solution is added to a colloidal solution of ferric hydroxide?
  - (ii) Why, sun looks red at the time of sunset?
- **26.** Sulphuric acid is not used during the reaction of alcohols with Kl. Give reason.

OR

Phenol is more easily nitrated than benzene. Why?

27. Co(III) forms paramagnetic octahedral complex with weak field ligands whereas it forms diamagnetic octahedral complex with strong field ligands. Compile the give information and explain it in you own words.

# **SECTION: C**

# (Long answer type | questions)

**28.** (i) Complete the following reactions:

(a) 
$$CH_3CH_2CH_2CH_2Cl. \xrightarrow{Alc. KOH}$$
  
(b)  $CH_3CH_2CHCH_3 \xrightarrow{Alc. KOH}$   
 $Cl$ 

- (ii) What is the type of the above reactions?
- (iii) Predict the major product formed in reaction(b).
- **29.** Describe the role of
  - (i) NaCN in the extraction of gold from gold ore.
  - (ii) SiO<sub>2</sub> in the extraction of copper from copper matte.
  - (iii) cryolite in the metallurgy of aluminium.
- **30.** Deduce the shapes of the following on the basis of VSEPR theory.
  - (a) BrF<sub>3</sub>
- (b)  $I_3^-$
- (c) IF<sub>7</sub>
- 31. An aromatic compound A on treatment with aqueous ammonia on heating forms a compound B, which on heating with  $Br_2$  and KOH forms a compound C of molecular formula  $C_6H_7N$ . Write the structures and IUPAC names of compounds A, B and C.

$$A \xrightarrow{aq.NH_3} B \xrightarrow{Br_2/KOH} C_6H_7N$$

- (i) Illustrate the Gattermann reaction with an example.
- (ii) Give chemical tests to distinguish between a primary and a secondary amine.

- 32. The letters 'D' or 'L' before the name of a stereoisomer of a compound indicate the correlation of configuration of that particular stereoisomer. This refers to their relation with one of the isomers of glyceraldehyde. Predict whether the following compound has 'D' or 'L' configuration.
  - CHO HO — H HO — H HO — H CH<sub>2</sub>OH
  - (ii) Aldopentoses named as ribose and 2-deoxyribose are found in nucleic acids. What is their relative configuration?

OR

- (i) Monosaccharides contain carbonyl group hence are classified, as aldose or ketose. The number of carbon atoms present in the monosaccharide molecule are also considered for classification. In which class of monosaccharide will you place fructose?
- (ii) In nucleoside, a base is attached at '1' position of sugar moiety. Nucleotide is formed by linking of phosphoric acid unit to the sugar unit of nucleoside. At which position of sugar unit is the phosphoric acid linked in a nucleoside to give a nucleotide?
- **33.** (i) Express the relation between conductivity of a solution cell constant.
  - (ii) Determine the values of equilibrium constant ( $K_c$ ) and  $\Delta G^0$  for the following reactions as 25°C.

Ni(s) + 2Ag<sup>+</sup>(aq) 
$$\longrightarrow$$
 Ni<sup>2+</sup>(aq) + 2Ag(s),  
 $E^{\circ} = 1.05 \text{ V}$  [ $F = 96500 \text{ C mol}^{-1}$ ]

**34.** Calculate the mass of a non-volatile solute (molar mass = 40 g mol<sup>-1</sup>) which should be dissolved in 114 g octane to reduce its vapour pressure to 80%?

# **SECTION - D**

- 35. (i) On heating compound (A) gives a gas (B) which is a constituent of air. This gas when treated with 3 moles of hydrogen (H<sub>2</sub>) in the presence of a catalyst gives another gas (C) which is basic in nature. Gas C on further oxidation in moist condition gives a compound(D) which is a part of acid rain. Identify compounds (A) and (D) and also give necessary equations of all the steps involved.
  - (ii) Describe the following:
  - (a) The stability of oxoacids of chlorine increases in the order.

- (b) Fluorine exhibits an oxidation state of -1 only, while other elements of the family exhibits oxidations state of -1, +1, +3, +5 and +7.
- (c) F<sub>2</sub> is more reactive than CIF<sub>3</sub> which is more reactive than Cl<sub>2</sub>.

OR

- (i) What happens, when
- (a) potassium chlorate (KCIO<sub>3</sub>) is heated in the presence of manganese dioxide (MnO<sub>2</sub>)?
- (b) copper reacts with concentrated H<sub>2</sub>SO<sub>4</sub>?
- (ii) Explain the following trends in the properties of the elements compounds of p-block.
- (a) Thermal stability decreases from H<sub>2</sub>O to H<sub>2</sub>Te.
- (b) Fluoride ion has higher hydration enthalpy than chloride ion.
- (c) Electron gain enthalpies of halogens are largely negative.
- **36.** For fist order decomposition,

 $X \rightarrow Y + Z$ , rate constant is given by  $k = (4.6 \times 10^{14} \text{s}^{-1}) \text{ e}^{-54000/\text{RT}}$ 

Where, the energy of activation is in calories. Calculate

- (i) temperature at which X would decompose at the rate of 1% per second
- (ii) temperature where decomposition is 80% complete in 1h.

OR

- (i) In a reaction, if the concentration of the reactant R is quadrupled, the rate of reaction becomes sixty four times. What is the order of reaction?
- (ii) The rate constant of a reaction increased by 7% when its temperature is raised from 300 K to 301 K while its equilibrium constant increases by 3%. Calculate the activation energy of the forward and backward reactions. (Given,  $\Delta H$  for 3% increase in  $\Delta_r H^0 = 22.19 \text{kJ/mol}$ )
- 37. An organic compound 'A' with molecular formula C<sub>6</sub>H<sub>6</sub>O reacts with zinc dust to give a hydrocarbon 'B' which upon reaction with CH<sub>3</sub>Cl in the presence of anhydrous AlCl<sub>3</sub> gives 'C'. Compound C on oxidation with alkaline KMnO<sub>4</sub> gives compound D. Compound A, B, C, D and E; also justify your answer by giving relevant chemical equations.

OR

- (i) How will you convert
  - (a) phenol into picric acid?
  - (b) cumene into phenol>
- (ii) Write the structures of A and B in the following reactions:

(a) 
$$CH_3CH_2Br + Ag$$
 $CH_3CH_2Br + Ag$ 
 $CH_3CH_2Br + Ag$ 
 $A+B$ 

(b)  $CH_3OCH_2Cl + CH_3MgI \xrightarrow{Dry \text{ ether}}$ 
 $A+B$ 

(c)  $CH_3CH_2Br + Ag$ 
 $A+B$